¿Â¶óÀÎ°ú ¿ÀÇÁ¶óÀÎ À¯ÅëÃ¤³Î°£Ç °æÀï¿¡ ´ëÇÑ »õ·Î¿î Á¶¸í

A New Perspective on Competition between Retail and Electronic Stores

¾È°´ÈÆ, ÀÌ°´ÅÂ, ÃÖ°´»ï

ÇÑ±°úÇÐ±â¼ú¿ø Å×Å©³ë°æ¿µ´ëÇÐ¿ø

bhahn@kgsm.kaist.ac.kr, btlee@kgsm.kaist.ac.kr, bschoi@kgsm.kaist.ac.kr

Abstract

There have been several attempts to describe the recent phonemona of e-tailing and the competition of e-tailers with traditional retailers. However, it appears that the previous models exhibit some shortcomings. With an extension of the well-known circular city model, this paper attempts to relax those limiting assumptions and addresses various issues around electronic commerce: whether e-tailing will eventually drive out traditional retailing, whether e-tailing will necessarily increase competition and lead to lower prices, and whether all the consumers will be better off with more alternatives to choose from.

1. Introduction

While electronic commerce is undoubtedly changing the way business is conducted and growing rapidly, $6.9 billion in sales by on-line retailers represents less than one percent of the total retail sales during the fourth quarter of 1999 in the US. Even the highest estimate for virtual retail sales in 2003 ($108 billion) is less than 5.0% of total estimated retail sales (Rosen and Howard (2000)). This seemingly big discrepancy between the advocated potential and the reported mere share of e-commerce suggests that there is a growing need to look into the genuine nature of electronic channel and the future of marketing channels.

As summarized in the ensuing section, some analytical models have been proposed to characterize the competition between e-tailing and retailing. However, we argue that the models suggested are based on some overly restricted assumptions so that the studies are mostly compatible with earlier hypes made by the industry. Our primary goal of this research is to relax those limiting assumptions so that we can examine these issues: whether e-tailing will, as was often believed at the early Internet boom, eventually replace traditional retailing, whether e-tailing will necessarily increase competition and lead to lower prices, and whether all the consumers will be better off with more alternatives to choose from.

Arguably, the most objective and observable economic measure of e-commerce impacts is price. It may indicate the changes in the degree of competition and consumer welfare by e-commerce. It is widely expected that the introduction of electronic commerce lowers search costs of consumers and boosts competition, which results in lower prices. Several studies have confirmed this idea with data from several industries (Brown and Goolsbee (2000) for the life insurance industry, and Brynjolfsson and Smith (1999) for books and CDs). However, other studies have found contrary results, *i.e.*, prices either modestly lower or actually higher than their off-line counterparts (Bailey (1998) for books, CDs, and software, Lee (1997) for used cars). While these empirical data provide invaluable insights on e-business impacts on the market, proper cautionary note must be recognized in accepting these evidences. The transaction costs factors involved in electronic and non-electronic media may be significantly different, making it rather difficult to justify a direct comparison of the observed prices in the two market mechanisms. The more serious problem arises from the fact that markets are currently far from equilibrium. At this turbulent time of drastic shifts, empirical studies should be supplemented by theoretical ones.

2. Theoretical Foundations

Balasubramanian (1998), as a way to model the competition between traditional off-line retailers and direct marketers, included the attractiveness of on-line shopping in his model. But the same amount of cost is assumed to be imposed when a consumer purchase on-line, *i.e.*, consumers are assumed to be completely homogeneous in the transaction costs for using direct marketing channel. Besides, due to another critical assumption of sufficiently high willingness-to-

pay of consumers for a product and a fully covered market *ex ante* and *ex post*, it failed to fully explain the role of new media, for the most important role of on-line media as a marketing channel can be found in that it possibly covers the niche market not served by the traditional channel.

Viswanathan (2000) proposed a framework to describe the multi-channel environment, modeled as two cities, one for on-line population and the other for off-line population, which meet each other at one point. But still their model assumed that on-line and off-line population are determined exogenously. We argue the relative split of on-line and off-line consumers should be determined endogenously as more users have both choices available.

By relaxing the aforementioned limitations, we build a two-dimensional location model by adding another dimension to the geographical one. The second dimension reflects the fact consumers are differentiated with respect to not only their physical locations but also their technological savviness. The newly-introduced virtual dimension reflects the varying preference of consumers with respect to how good they are at using Internet technologies to gather and process relevant information, what they think of the transaction security of Internet, and how much value they put on instant gratification and physical inspection. Physical and on-line channels are not perfectly substitutable, *i.e.*, they have their own merits and demerits, so they might appeal to the different segments of the market. Depending on the type of customers and the nature of products, some consumers prefer physical to on-line channel, and *vice versa*.

3. Research Methodology

We propose a model with an additional dimension to the circular city model by Salop (1979) (Figure 1). Consumers are assumed to be distributed uniformly over the lateral surface of the cylinder. The height of the cylinder and the length of the circumference of the top and bottom faces are unity, respectively. The number of n physical retail stores are located at equal distances from each other along the edge of the bottom face. What is interesting is how to locate an electronic store. Electronic businesses are independent of physical distance and are located at the opposite end of retail shops, so we can locate it along the edge of the top face of the cylinder. For the ease of explanation we will take its development figure and convert it into a more tractable two-dimensional space.

To suitably model the interaction taken place in physical and electronic marketplace, we incorporate two cost factors. One is the well-known physical transportation cost considered in Hotelling (1929) and Salop (1979).

Let t refer to the time and dollar costs incurred by a consumer as he/she travels a unit distance in the physical space. Secondly, let τ denote this channel misfit cost or 'mental' transportation cost explained the above section. In other words, τ is to the newly-introduced space what t is to the physical space. Let us set the position of a retailer as the origin. The total cost, other than price of a good, that a consumer (x,y) in Figure 1 should pay is $tx + \tau y$ if he/she buys at retail stores, $\tau(1-y)$ if she buys on-line. Let $\bar{u}(>0)$ the maximum any consumer is willing to pay for a good and p_r, p_e the prices of retailers and the e-tailer, respectively, then the net utility the consumer at (x,y) is

$$u(x,y) = \left\{ \begin{array}{ll} \bar{u} - tx - \tau y - p_r & \text{if } buys\ offline \\ \bar{u} - \tau(1-y) - p_e & otherwise \end{array} \right\}$$

For the simplicity of the analysis, we assume that the retailers are symmetric, *i.e.*, they coordinate their actions to best cope with the threat posed by e-tailing. This assumption amounts to assuming that they jointly maximize their overall profit. The fixed and variable costs of the retailers and the e-tailer are also assumed to be zero.

4. Results and Discussion

We obtain the following proposition from the profit function of the e-tailer.

Proposition 1 *It is unprofitable for the e-tailer to lower its price to the level where it covers all the market.*

From the e-tailer's point of view, increasing its price and increasing its revenue from inframarginal consumers at the expense of some market share is more profitable. So, we can conclude that it is unprobable that e-tailing entirely replace traditional retailing in the future.

Now, we turn to the issue of the effect of e-tailing on market prices and consumer welfare.

Proposition 2 *The introduction of e-tailing might increase the level of market prices and leave a certain group of consumers worse-off.*

Let us consider the typical cases given in Figure 2. In Figure (2a), e-tailing has no effect on traditional retailing, so no effect on retail price. E-tailing increases consumer welfare by the welfare increase of the consumers it serves. In Figure (2b), e-tailing boosts the competition in the market and results in lower price. All the consumers are better-off at the expense of only the traditional retailers.

The most striking case is Figure (2c), where the retail price has increased after the introduction of e-tailing. The introduction of e-tailing inevitably takes over some of the retailer's existing market. Reduced market in conjunction with the e-tailer's high price gives rise to the rise in the retailers' price. This result is contradictory to the prior claim that e-tailing will intensify the competition in the market and bring about lower prices.

Figure (2d) depicts the various segments of consumers in Figure (2c). The first segment is the consumers whom the retailer served before and after the introduction of e-tailing (A'J'B'CDE'K' in Figure (2d)). They remain as patrons to retailers, while paying higher price than before. The second one is the consumers who are newly served by the e-tailer (FGJAKHI in Figure (2d)). They have not been served before, so their surplus is greatly increased with the introduction of e-tailing. On-line groceries such as Peapod.com and Webvan.com have benefitted dual-income families who have little time to shop at retail stores and on-line bookstores such as Amazon.com and Barnes and Noble.com have enabled full-time workers to purchase books. The third one is the consumers whom the retailers served before, but now the e-tailer serves (AJJ'A'K'K in Figure (2d)). Their welfare change is positive because many near-marginal consumers of the retailers have now become the inframarginal consumers of the e-tailer. The fourth segment of consumers who were served by the retailer, but no longer served (BB'J'J and K'E'EK in Figure (2d)) experience the reduction in surplus due to the higher price. The final one is the consumers who are still not served as ever (GBJ and KEH in Figure (2d)).

Therefore, although some consumers, especially those who have not been served by traditional retailers and who have been served by traditional retailers near-marginally, happen to have more alternatives with the introduction of e-tailing and the total level of consumer welfare has increased, not all the consumers are better-off. There are consumers whom traditional retailers did not serve and new electronic media cannot reach. What is worse, some consumers, typically the old customers of the traditional retailers, have to pay more and some cease to consume. Hence, we conclude that the total consumer surplus may be increased but at the expense of some specific segments of digitally disadvantaged consumers.

5. Conclusion

We show that e-tailing cannot entirely replace traditional retailing under any circumstances. We also argue that some of the customers can be worse-off from introduction of e-tailing business because prices could move in either direction despite the increase in competition. In some extreme cases, some customers who were previously served by retailers before the introduction of e-tailing could be driven out of the market. In other words, our model characterizes economics of so-called *digital divides*. Though it is widely believed that e-tailing generally benefits all the consumers by offering more alternatives, some concerns about the issue of equity are being raised. For example, nonprofit organizations and initiatives such as 'Digital Divide Network' (http://www.digitaldividenetwork.org) point out the existence of a gap between people and communities who can make effective use of information technology and those who cannot and the welfare loss resulting from unequal adoption of technology. We believe our model can help analyze and solve the problem of *digital divides*.

References

Balasubramanian, S., ``Mail versus Mall: A Strategic Analysis of Competition between Direct Marketers and Conventional Retailers,'' Marketing Science 17 (3): 181-195, 1998

Bailey, J., "Intermediation and Electronic Markets: Aggregation and Pricing in Internet Commerce", *Ph. D Thesis*, Department of Electrical Engineering and Computer Science, MIT, 1998

Brown, J.R. and Goolsbee, A., "Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry", *mimeo*, University of Chicago, 2000

Brynjolfsson, E. and Smith, M., "Frictionless Commerce? A Comparison of Internet and Conventional Retailers", *MIT Working Paper*, 1999

Hotelling, H, "Stability in Competition," Economic Journal 39: 41-47, 1929

Lee, H.G., "Do Electronic Marketplaces Lower the Price of Goods?", *Communications of ACM* 41 (1): 73-80, 1997

Rosen, K.T. and Howard, A.L., ``e-Retail: Gold Rush or Fool's Gold?,'' California Management Review 42 (3): 72-100, Spring 2000,

Salop, S. C., ``Monopolistic Competition with Outside Goods,'' Bell Journal of Economics 10: 141-156, 1979

Viswanathan, Sivakumar, "Competition Across Channels: Do Electronic Markets Complement or Cannibalize Traditional Retailers?", Proceedings of the International Conference on Information Systems, December 2000
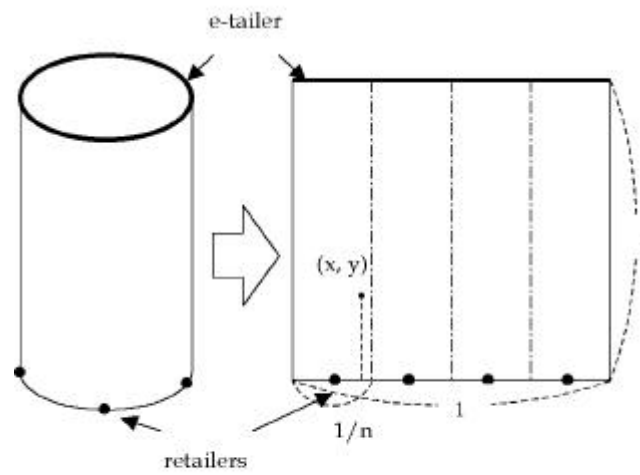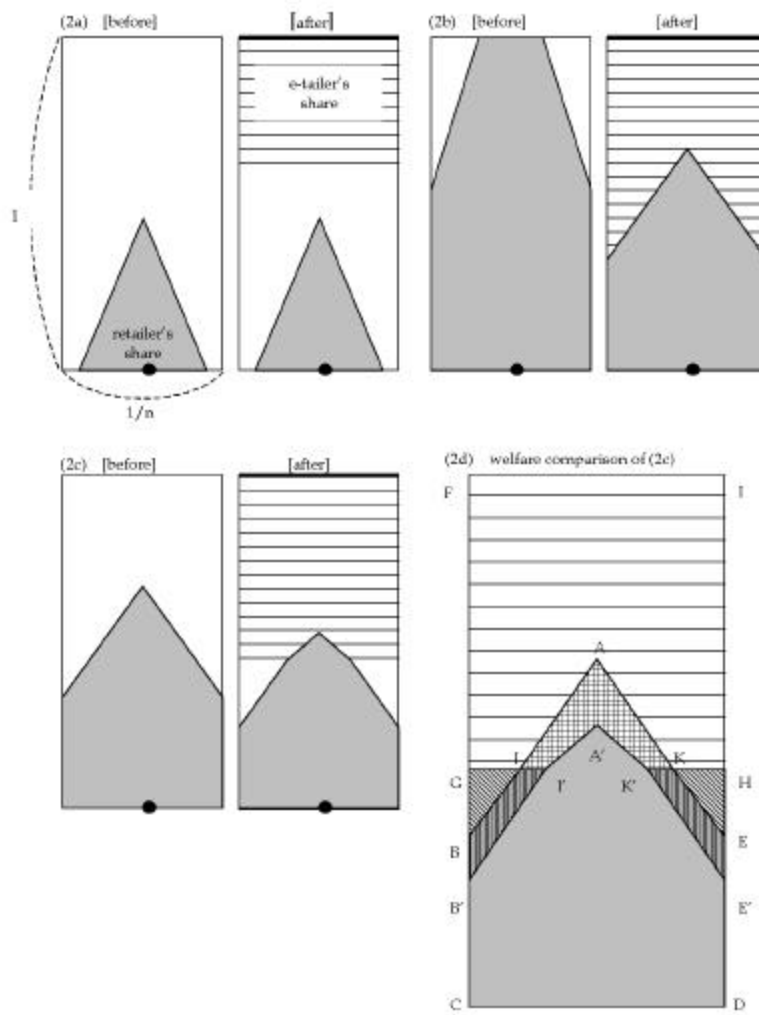
Figure 1: Cylindrical City Model

Figure 2: Equilibria of Some Typical Cases and Welfare Comparison